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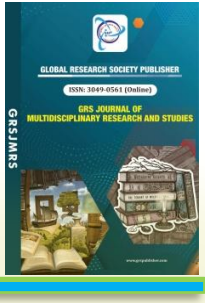

Statistical Analysis of the Geological Texture and Environmental Pollution, Impact Caused By Urbanization on Students of Federal University Lokoja, Kogi State

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Abstract: This study examines the statistical analysis of the geological texture and environmental pollution, impact caused by urbanization on students of Federal University Lokoja, Kogi State. Rising percentage of people is living in settlements classified as urban regions, a phenomenon known as urbanization. It typically comes from a natural growth (the excess of births over deaths) or the net migration of individuals from rural to urban regions. However, depending on the criteria applied, different countries have different definitions of what constitutes an urban center. This over congestion in Lokoja is popularly found along Felele express road which had caused serious damage to the road texture and had resulted into multiple accidents that claims life of students of Federal University Lokoja. The rampant accident that claims life and properties along felele Lokoja express road is attributed to the geological effect and Urbanization, a hallmark of development, is rapidly transforming Lokoja, the capital of Kogi State into mega state like Lagos, road is becoming extremely busy, dangerous and congested. Accidents on Lokoja felele road is becoming rampant as while as air pollution by smokes and dangerous exhaust released by moving trucks day and night which affects more and larger crowd than. Effect of geological texture and environmental on road texture (felele express road). The study concluded that statistically that road damage and air pollution has effect on resident health status. The relationship of the effect between road damage/ air pollution and resident health status is statistically significant according to the observation from the respondent's response. And some recommendation is put forward which includes restructure of Abuja Lokoja Felele Road.

The study recommends that more training be undertaken to sensitize farmers to adopt more CSAT and increase awareness of CSAT. It is recommended that the Ministry of Agriculture and the National Agricultural Marketing Board (NAMBoard) improve its extension services, capacitation of farmers through CSA workshop and diversify CSA interventions to other enterprises.

Keywords: *Environmental pollution, Geological texture, Urbanization and Development.*

Cite this Article

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Introduction

Federal University Lokoja is located along Abuja Lagos express road in area known as Felele, concentration of urban migration concentrated in that same region as well, rising percentage of people are living in settlements classified as urban regions, a phenomenon known as urbanization. The rampant accident that claims life and properties along felele Lokoja express road may actual be attributed to the geological effect and Urbanization, a hallmark of development, is rapidly transforming Lokoja, the capital of Kogi State into mega state like Lagos, road is becoming extremely busy and congested. Accidents on Lokoja felele road is becoming rampant as while as air pollution by smokes and dangerous exhaust released by moving trucks and vehicles during day and night is more dangerous because it affects more and larger crowd. Effect of geological texture and environmental on road texture (felele express road) is due to infrastructure under development and hunger for economic growth of urbanization, some effects includes pollution, habitat deterioration, and greater demand on limited resources are some of the environmental issues that follow. Examining the effects of urbanization on waste management, contamination of the air and water and the encroachment of built-up regions on natural ecosystems. Economic development and growth are anticipated to accelerate as cities grow, bringing about social transformation and improving both the urban core and the surrounding rural areas. This isn't always the case in developing nations, where urbanization has resulted in a persistently worsening housing crisis, as well as problems with water and sanitation. This study examines how urbanization affects on FUL and it seeks to investigate the specific environmental impacts of urbanization. FUL, focusing on key issues such as water quality, air pollution, waste management, and the degradation of

natural habitats. Observations in the field, evaluations of the environmental quality, and surveys of the university community will all be incorporated. In order to lessen the detrimental environmental effects of urbanization.

Urbanization in Lokoja has led to significant environmental changes that threaten the sustainability of ecosystems and human health within the city, including the area surrounding Federal University Lokoja. Green spaces are being destroyed, pollution is rising, and poor garbage disposal is a result of the quick development of commercial, industrial, and residential regions. Due to its close proximity to Lokoja's urban core, FUL is susceptible to these changes, which could have an impact on the university's environment as well as the standard of living for its teachers, staff, and students.

Literature

In Nigeria, urbanization plays a significant role in the socioeconomic development of towns and cities through rapid infrastructural construction and population growth. Located near the meeting point of the Niger and Benue rivers, Lokoja has experienced substantial urban growth since assuming the role of Kogi State capital in 1991. Due to its advantageous position, the city has become a commercial powerhouse that draws in enterprises, industries, and immigrants. On the other hand, the quick speed of urbanization has brought about environmental issues such as increasing pollution, deforestation, biodiversity loss, and insufficient waste management systems. Lokoja, situated at the confluence of the Niger and Benue rivers, has witnessed significant urban expansion since becoming the capital of Kogi State in 1991.

Urbanization is a worldwide occurrence that carries noteworthy environmental consequences, especially in developing nations where local authorities are often unable to keep up with the challenges posed by fast urban growth. According to studies, urbanization usually results in higher pollution levels, deforestation, and a decline in biodiversity (Satterthwaite, 2017). In Nigeria, the rate of urbanization has increased in the last several years, leading to a number of environmental challenges such as air and water pollution and poor waste management (Efe, 2015).

In order to give a thorough assessment of the environmental impact of urbanization on Federal University Lokoja, the study will use a mixed-methods approach, integrating quantitative and qualitative data collection techniques. To evaluate waste management procedures and pinpoint areas in need of improvement, a survey of the FUL community will be undertaken. The creation of garbage, disposal techniques, and environmental sustainability awareness will be the main topics of the survey. The effect of geological texture and environmental on road texture (felele express road), While infrastructure development and economic growth are benefits of urbanization, pollution, habitat deterioration, and greater demand on limited resources are some of the environmental issues that follow. Examining the effects of urbanization on waste management, contamination of the air and water, and the encroachment of built-up regions on natural ecosystems. Economic development and growth are anticipated to accelerate as cities grow, bringing about social transformation and improving both the urban core and the surrounding rural areas. This isn't always the case in developing nations, where urbanization has resulted in a persistently worsening housing crisis, as well as problems with water and sanitation. This study examines how urbanization effects on FUL and it seeks to investigate the specific environmental impacts of urbanization. FUL, focusing on key issues such as water quality, air pollution, waste management, and the degradation of natural habitats. Observations in the field, evaluations of the environmental quality, and surveys of the university community will all be incorporated. In order to lessen the detrimental environmental effects of urbanization on FUL and its surrounds, policies and practices will be incorporated in findings.

A rising percentage of people are living in settlements classified as urban regions, a phenomenon known as urbanization. It typically comes from a natural growth (the excess of births over deaths) or the net migration of individuals from rural to urban regions. However, depending on the criteria applied, different countries have different definitions of what constitutes an urban center. Numerous features of urban transformation between 1950 and 2000 were unprecedented, according to Satterthwaite (2005). Economic development and growth are anticipated to accelerate as cities grow, bringing about social transformation and the enhancement of both metropolitan areas and the larger rural hinterland. On the other hand, things are different in developing nations, where urbanization has made housing issues, traffic jams, the emergence of slums, and issues with water and sanitation in developing nation cities worse.

Thus, these, in addition to food insecurity, energy, poverty, and poor planning habits, have compounded urban issues in Nigeria with their antecedent effects on the quality of life of the people. Urbanization can be broadly defined as the transformation of rural areas into urban centers, marked by the development of infrastructure, housing, industries, and services. This process is often driven by migration from rural areas to cities in search of better economic opportunities and living standards. However, urbanization often outpaces the ability of governments and institutions to manage the environmental impacts that accompany such rapid development. In cities like Lokoja, where urbanization is rapid but infrastructure and planning systems are lagging, environmental degradation is a common consequence. The following key environmental issues have been linked to urbanization in Lokoja, and by extension, to Federal University Lokoja:

Geological degradation of road texture: With urban expansion comes an increase in vehicular traffic, industrial activities, and construction, all of which contribute to the degradation of road quality. In Lokoja, the rise in the number of vehicles and trucks, coupled with poorly regulated industrial emissions, has led to increased levels of road damage and the government is not doing much about it.

Air Pollution: With urban expansion comes an increase in vehicular traffic, industrial activities, and construction, all of which contribute to the degradation of air quality. In Lokoja, the rise in the number of vehicles, coupled with poorly regulated industrial emissions, has led to increased levels of air pollutants such as particulate matter (PM2.5 and PM10), nitrogen oxides (NOx), carbon monoxide (CO), and sulfur dioxide (SO2). These pollutants have significant health implications for the university community, as exposure to poor air quality can lead to respiratory issues, cardiovascular problems, and reduced cognitive function.

Water Pollution: The Niger and Benue rivers, which flow through Lokoja, are crucial water sources for both the city and the university. However, these water bodies are increasingly contaminated by untreated industrial effluents, agricultural runoff,

and improper waste disposal practices. The pollution of these rivers poses a serious risk to the water quality on campus, particularly as urban runoff from the surrounding areas seeps into the water supply. Contaminated water not only affects human health but also the broader ecosystem that depends on the rivers for survival.

Waste Management: Due to the city's rapid growth outpacing the development of suitable waste disposal infrastructure, solid waste management is still a major concern in Lokoja. Unsanitary conditions have been brought about by the improper dumping of solid waste in public areas, near bodies of water, and outside the municipal limits. This has led to the contamination of water sources and an increase in bugs that spread disease. Like other educational institutions in the city, Federal University Lokoja faces waste management challenges since improper disposal of both solid and liquid waste puts the campus community's health at danger.

Deforestation and Encroachment on Natural Habitats: As cities grow, developed areas frequently encroach on natural ecosystems, causing deforestation and biodiversity loss. Land in Lokoja that was formerly utilized for farming or abandoned as natural habitat is increasingly being converted into residential or commercial zones. This encroachment threatens local flora and fauna and disrupts ecosystems that are critical for maintaining ecological balance. For Federal University Lokoja, the loss of green spaces and natural landscapes has both environmental and aesthetic consequences, diminishing the quality of the campus environment and reducing opportunities for research on local biodiversity.

The global trend of urbanization is further increasing, and as of 2021, more than 56% of the world's population resides in urban areas (United Nations,2019). Cities and towns are expanding, the global population is increasing, and young people are moving to cities to find work and a better life, especially in the rapidly developing countries. More residential, commercial and industrial areas are needed to satisfy the demands of a increasing urban population. Sustainability, quality of life, health, air quality, moderate temperatures within city boundaries, urban climate, green spaces, and closeness to nature and recreation need to be heeded when planning the future state of our living space. With the unprecedented speed of urban development, planning measures to provide for these considerations is even more difficult.

Urbanization and the academic setting interact in a complicated and multidimensional way. On the one hand, urbanization can help higher education institutions by creating chances for infrastructure improvements and economic growth. On the other hand, unchecked urban growth can lead to environmental and social problems that make it more difficult for colleges to carry out their educational goals. These difficulties are becoming more noticeable at Federal University Lokoja as the surrounding city grows.

If proactive steps are not made to counteract these impacts, the environmental quality within and around the institution is expected to degrade as Lokoja continues to urbanize. Due to its close proximity to Lokoja's metropolitan core, the institution is especially susceptible to environmental stressors brought on by urbanization, such as pollution. As an illustration, the increase in vehicular traffic around the university has led to higher levels of noise pollution, which can disrupt the academic activities of students and staff. Similarly, the encroachment of built-up areas into previously undeveloped land around the university limits the availability of natural spaces for recreation and research.

Analysis and Results

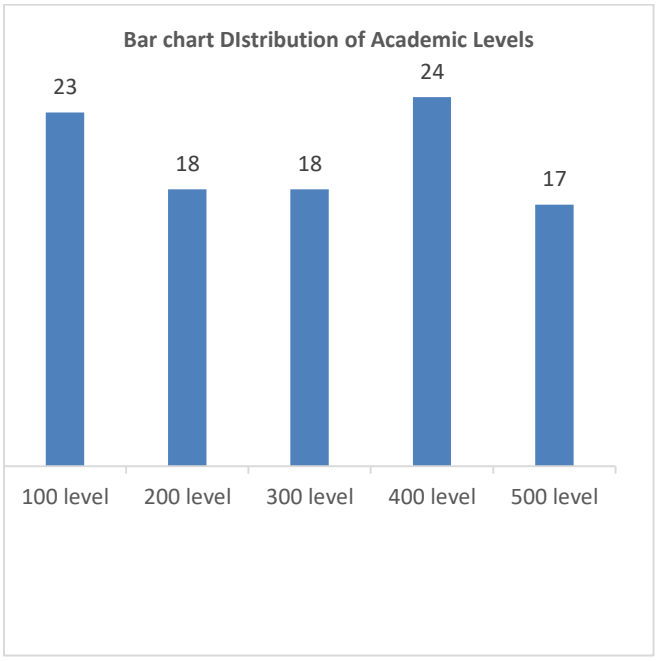

Figure 1: Bar Chart Distribution of Academic Level of Respondence

The demographic distribution of respondents across academic levels shows that 400 level students had the highest respondents with 24 followed by 100 level students with 23 respondents. Both 200 and 300 level students recorded equal response with 18 respondents each .500 level students had the lowest with 17 respondents each. In general the survey shows a balanced participation across all academic levels.

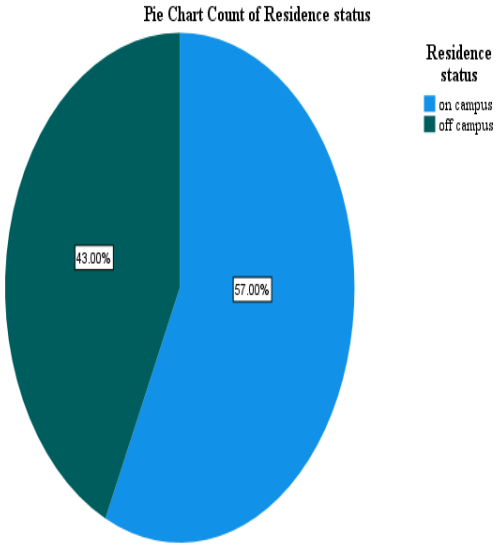

Figure 2: Pie Chart Count of Residence Respondence

The pie chart shows that the majority of the respondents representing 57% reside on campus while 43% live off campus . This indicates that a larger proportion of the respondents have easier access to campus facilities and academic activities. However, the percentage of off-campus residents is significant showing balance distribution among respondents.

Objective 1

To evaluate how the FUL environment has been impacted by the alterations in land use, road damage and land cover that have occurred in Lokoja during the last ten years.

Table 1: Academic and Urban Expansion Cross Tabulation

A large proportion of respondents majorly among 100 level shows strongly agreed **(46.15%)** that urban

Urban expansion has reduced green areas

Levels	**Strongly Agreed**		**Agreed**		**Disagreed**		**Strongly Disagreed**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**
100 Level	**12**	46.15	**10**	38.46	**3**	11.23	**1**	3.84
200 Level	**2**	11.11	**7**	38.88	**6**	33.33	**3**	16.67
400 Level	**6**	28.57	**7**	33.33	**5**	23.81	**3**	14.29
500 Level	**2**	11.76	**6**	35.29	**6**	35.29	**3**	17.65

Expansion negatively affected green areas. Similar responses across other academic levels where combined percentage of agreement are higher than disagreement showing general believe that land alteration has significantly contributed to land degradation.

Table 2: Construction has altered natural landscape Crosstabulation

Residence Status	**Strongly Agreed**		**Agreed**		**Disagreed**		**Strongly Disagreed**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**
ON campus	**27**	54	**16**	32	**5**	10	**1**	2
OFF campus	**28**	56	**13**	26	**6**	**12**	**3**	6

The cross tabulation shows that large respondents base on their respondents (on and off campus) agreed that a large of a proportion of respondents agreed that construction activities have significantly altered the natural environment. Among the on-campus respondents 54% strongly agreed while 32% agreed that construction has altered the natural land scape. This shows statistically that 86% of on-campus resident shows noticeable environmental changes caused by construction activities.

Objective 2

To assess the effects of urbanization on the quality of the water on the FUL campus and its environs, paying particular attention to possible contamination from urban and industrial run-off.

Table 3: Anova Test 1

Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	**9.972**	**7**	**1.425**	**1.470**	**.188[b]**
Residual	**89.188**	**92**	**.969**		
Total	**99.160**	**99**			

Hypothesis Statement

$H_{0:}$ Urbanization does not have significant effect on water quality around FUL campus

$H_{1:}$ Urbanization has significant effect on water quality around FUL campus

Test Statistic

Regression analysis

R^2= 0.101

p- Value = 0.188

Level Of Significance

α = 0.05

Decision Rule

Reject H_0 if p-value is less than alpha value otherwise there is no sufficient reason to reject H_0

Conclusion

Since p-value is 0.188 while alpha value is 0.05 therefore p-value is less than alpha value therefore, null hypothesis is rejected and we conclude statistically that urbanization does not have significant effect on water quality around the campus. Additionally, Urbanization have effect on water quality but the effects is not statistically significant.

Objective 3

To evaluate the degree of road damage, air pollution in the vicinity of the FUL campus and its impact on the general public's health among university residents.

Table 3: Anova Test 2

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.929	5	.786	1.173	.328[b]
Residual	62.981	94	.670		
Total	66.910	99			

Hypothesis Statement

$H_{0:}$ Air pollution has no significant effect on the health of residents around the federal university Lokoja

$H_{1:}$ Air pollution has significant effect on the health of residents around the federal university Lokoja

Test Statistic

Regression analysis

R^2= 0.037

p- Value = 0.163

Level Of Significance

α = 0.05

Decision Rule

Reject H_0 if p-value is less than alpha value otherwise there is no sufficient reason to reject $H_{0.}$

Conclusion

Since p-value is 0.328 while alpha value is 0.05 therefore p-value is greater than alpha value therefore, null hypothesis is rejected and we conclude statistically that road damage and air pollution has effect on resident health status. The relationship of the effect between road damage/ air pollution and resident health status is statistically significant according to the observation from the respondent's response.

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Discussion

The cities of Lokoja strategic location has made it a commercial hub, attracting businesses, industries, and migrants. However, the rapid pace of urbanization has introduced environmental concerns, including increased pollution, deforestation, loss of biodiversity, and inadequate waste management systems. Federal University Lokoja, established in 2011, is located within the urban environment of Lokoja and is not immune to these environmental challenges. As the city expands, so does the university, which faces growing pressure from the surrounding urban area. The proximity of the university to the Niger and Benue rivers, along with its exposure to urban pollutants, raises concerns about the sustainability of its environment and the well-being of its academic community. Urbanization, a worldwide phenomenon driven by population expansion and economic advancement, has emerged as a characteristic of cities all over the world, especially in developing countries. Nigeria is one of the African nations that is urbanizing the fastest, with an annual growth rate of roughly 4% for its urban population. Urbanization, the concentration of opportunities and services in cities, and rural-urban migration are some of the causes driving this rapid urban expansion. Urbanization presents serious environmental issues even though it also has many positive effects, such as increased employment, stronger infrastructure, and easier access to services. These difficulties are most noticeable in cities, where governance and planning frameworks are frequently insufficient to keep up with the quick rate of development. Kogi State's capital, Lokoja, is no exception. The findings of this study reveal that

Conclusion and Recommendation

This study concludes summarily that Lokoja needs urgent government intervention to repair and expand Felele Lokoja road to reduce the effect of geological damage of urbanization. To make recommendations for environmentally sound management techniques that will help Federal University Lokoja lessen the harmful effects of urbanization.

- Expansion of Felele Abuja Lokoja express road to allow free section movement for trucks, cars, Keke (tricycle) and bike (motorcycle)
- Increase awareness campaigns and environmental programs to enlighten residents
- Encourage proper waste disposal and restrict burning of refuse within cmpus
- Regular monitoring and air quality assesments should be conducted to identify pollution trends and early intervention
- Tree planting and green environmental practice to improve air quality and reduce pollutions level

Weakness And Future Research

This study provide valuable insights into geological damage done to the environment such as road, air pollution and water pollution, the study will be full if insecurity in Lokoja is examined in the future,

Authors Contributions

All authors contributed immensely in the aspect of technical writing.

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Ethics

This is the original manuscript; there will be no expectation of any ethical problems.

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